TENNESSEE DEPARTMENT OF EDUCATION
FIRST TO THE TOP

Nutrition Science and Diet Therapy

Primary Career Cluster:	Human Services
Consultant:	Deborah Thompson, (615) 532-2840, Deborah.Thompson@tn.gov
Course Code(s):	TBD
Prerequisite(s):	Nutrition Across the Lifespan (TBD)
Credit:	1
Grade Level:	11
Graduation Requirements:	• Satisfies one credit of laboratory science requirement • Satisfies one of three credits required for elective focus if taken in conjunction with other Human Services or Health Science courses.
Programs of Study and Sequence:	This is the third course in both the *Dietetics and Nutrition* and *Therapeutic Clinical Services* programs of study.
Necessary Equipment:	Nutrition laboratory, including basic kitchen equipment and general science lab equipment
Aligned Student Organization(s):	Family, Career and Community Leaders of America (FCCLA): http://www.tennesseefccla.org/ Brandon Hudson, (615) 532-2804, Brandon.Hudson@tn.gov
Coordinating Work-Based Learning:	If a teacher has completed work-based learning training, he or she can offer appropriate placement. For more information, please visit http://www.tn.gov/education/cte/wb/.
Available Student Industry Certifications:	American Association of Family and Consumer Sciences Pre-PAC Nutrition or Food Science Certificate
Dual Credit or Dual Enrollment Opportunities:	There are no statewide dual credit/dual enrollment opportunities for this course. If interested in establishing a local opportunity, reach out to your local postsecondary institution.
Teacher Endorsement(s):	050, 051, 450
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/HumanServices.shtml

Course Description

Nutrition Science and Diet Therapy is an applied knowledge course in nutrition for students interested in the role of nutrition in health and disease. The course covers the development of a nutrition care plan as part of the overall health care process Methods for analyzing the nutritional health of a community are explored. Finally, the relationship of diet and nutrition to specific diseases will be researched, including

the role of diet as a contributor to disease and its role in the prevention and treatment of disease. Artifacts will be created for inclusion in a portfolio, which will continue to build throughout the program of study. Standards in this course align to the Tennessee Common Core State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee Common Core State Standards for Mathematics, and Tennessee state standards for Biology I, Chemistry I, Human Anatomy & Physiology (A&P), and Scientific Research, as well as the National Standards for Family and Consumer Sciences Education, Second Edition.* The following standards should be implemented throughout the course as well as suggested 30 hours of time spent in the laboratory.

Program of Study Application

This is an applied knowledge course in the following programs of study. For more information on the benefits and requirements of implementing these programs in full, please see the following websites:

- *Dietetics and Nutrition:* http://www.tn.gov/education/cte/HumanServices.shtml
- *Therapeutic Clinical Services:* http://www.tn.gov/education/cte/HealthScience.shtml

Course Standards

Safety & Sanitation

1) Compile and critique safety and sanitation procedures related to handling, preparing, storing, and serving food from industry-approved technical manuals and government fact-sheets. Identify and review general common laboratory safety procedures including but not limited to prevention and control procedures. Incorporate safety procedures and complete safety test with 100 percent accuracy. (TN CCSS Reading 3; FACS 9)

Nutrition and Health Overview

2) Gather relevant information from multiple authoritative print and digital sources related to the importance of a balanced diet in the achievement of optimum nutrition. Compare and contrast nutritional needs of a normal healthy diet with the needs of a client being treated for and/or recovering from illness. Prepare an informative artifact to discuss the findings. (TN CCSS Reading 7; TN CCSS Writing 2, 8, 9; FACS 9, 14)

Nutrient Metabolism

3) Create a model and/or graphic illustrating the major metabolic pathways that are used to produce energy for the body. Write a narrative report explaining the chemical processes that occur at each stage in the pathway. Categorize each stage as an anabolic or a catabolic reaction, citing relevant evidence from academic or medical materials. Stages include:
    a. Glycolysis
    b. Kreb's cycle
    c. Electron Transport
    d. Fermentation

    (TN CCSS Reading 1; TN CCSS Writing 7; TN Biology II 3; FACS 9, 14)

4) Synthesize information on energy balance. Apply available tools and equations to calculate Estimated Energy Requirements (EER) for an individual. Determine the energy content of an

individual's diet. Based on the client's EER and calculated caloric intake, predict the effect on the client's weight. Calculate the following:

a. Physical Activity Level (PAL)
b. Total Energy Expenditure (TEE)
c. Basal Energy Expenditure (BEE)
d. Thermic Effect of Food (TEF)
e. Metabolic Equivalents (METs)

(TN CCSS Reading 1, 3, 7; TN CCSS Writing 2, 7; TN CCSS Math N-Q; TN Biology Embedded Math, TN A&P 5; TN Scientific Research 4; FACS 9)

Nutrients and Their Relation to Disease

Water

5) Gather relevant information from multiple scientific and technical texts to evaluate and create a model or graphic that illustrates the scientific properties of water. Using the research, write an explanatory essay detailing the functions of water in its relation to food, digestion, and maintenance of the body. (TN CCSS Reading 2; TN CCSS Writing 2, 4; TN Chemistry I 1; FACS 9, 14)

6) In a class discussion, compare and contrast the diseases associated with contaminated drinking water and the mortality rate of impoverished regions or communities using resources such as the U.S. National Library of Medicine or the National Institutes of Heath. (TN CCSS Reading 2, 9; FACS 9)
Suggested Labs: The Purification of Water

Carbohydrates

7) Analyze research to determine domain-specific terms that describe the molecular structure of carbohydrates and fiber in relation to their scientific function in food, food preparation, and the body. Create a graphic illustration/model to compare and contrast the differences in complex and simple carbohydrates and fiber. (TN CCSS Reading 2, 4, 6; TN Chemistry I 1; FACS 9, 14)
Suggested Labs: Hydrolysis of Sugar; Sweetness & Solubility; Digestion of Starch.

8) Research the impact of carbohydrates on diabetes, differentiating between Type I and Type II. Cite specific textual evidence from academic research, medical literature and news articles in order to:
    a. Describe the disease/condition, including symptoms and organ(s) affected.
    b. Justify the role of nutrition as a contributor to the disease/condition and highlight specific dietary recommendations for minimizing those contributions.
    c. Justify the role of nutrition in the treatment of the disease/condition, outlining a healthy eating plan and providing lists of specific foods/nutrients to reduce or exclude from the diet and those that should be included in the diet.
    d. Make recommendations for other lifestyle changes that will reduce the risk or aid in the therapy for the disease/condition.
    e. Prepare a menu item that meets the nutritional recommendations for diabetics.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 4, 6, 7, 8; TN A&P 1, 3; FACS 9)
    Suggested Labs: Meal Preparation for diabetic patient "Count the Carbs"

9) Research the correlation between starch consumption and Celiac Disease, citing evidence from academic journals and medical literature in order to
    a. Describe the disease/condition, including symptoms and organ(s) affected
    b. Explain the digestive problems and the impact on digestion and absorption of nutrients
    c. Make recommendations for other lifestyle changes that will reduce the risks or aid the therapy for the disease/condition
    d. Prepare a menu item that meets the nutritional recommendations for individuals with Celiac Disease

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 4, 6, 7, 8; TN A&P 1, 3; FACS 9)
    Suggested Labs: Compare & Contrast Alternative Ingredients for Gluten in Foods

Lipids

10) Analyze the properties and composition of lipids in relation to their functions in food preparation and to the body. Compare and contrast the composition of saturated and unsaturated fats using domain-specific terms in a class discussion or by creating a model/graphic. Write an explanatory text about the impact of nutrition on cardiovascular health, focusing on hypertension, stroke, and coronary artery disease. (TN CCSS Reading 2, 4, 6; TN CCSS Writing 2; TN Chemistry I 1; FACS 9, 14)

11) Investigate the correlation between fats in the diet and coronary artery disease, citing evidence from academic research, medical literature, and news articles in order to:
    a. Describe the disease/condition, including symptoms and organ(s) affected.
    b. Justify the role of nutrition as a contributor to the disease/condition, and highlight specific dietary recommendations for minimizing those contributions.
    c. Justify the role of nutrition in the treatment of the disease/condition, outlining a healthy eating plan and providing lists of specific foods/nutrients to reduce or exclude from the diet and those that should be included in the diet.
    d. Make recommendations for other lifestyle changes that will reduce the risks or aid the therapy for the disease/condition.
    e. Prepare a menu item that meets the nutritional recommendations for achieving good cardiovascular health.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 4, 6, 7, 8; TN A&P 1, 3; FACS 9)
    Suggested Labs: Bomb Calorimeter; Extraction of Fat in Hot Dogs; Fat Content in Beef; Testing Oils in Frying; Alternative Fats in Foods; Low Fat Cookery Lab.

Proteins

12) Cite textual evidence from academic research or medical literature to describe the molecular structure of proteins, and identify essential and nonessential amino acids. Compare and contrast complete and incomplete proteins by analyzing the functions of protein in food and their importance in the body. Research nutritional diseases related to insufficient protein. Describe ways in which protein is used in food preparation. (TN CCSS Reading 2, 4; TN Chemistry 1; FACS 9, 14)
    Suggested Labs: Effects of Minerals on Protein; Protein in Eggs.

Minerals

13) Determine the meaning of domain-specific terms to analyze the properties and composition of minerals within the human diet. Write an explanatory text describing the chemical and molecular composition of different minerals. (TN CCSS Reading 2, 4, 6; TN CCSS Writing 2; TN Chemistry I 1; FACS 9, 14)

14) Drawing on findings from medical research, compare and contrast the advantages and disadvantages of the use of food additives in processed products. Create a list of regulations governing the use of food additives established by the Food and Drug Administration (FDA) and U.S. Department of Agriculture (USDA). (TN CCSS Reading 2, 4, 6; TN CCSS Writing 2; FACS 9, 14)
Suggested Labs: Conduct a sensory evaluation of foods with and without food additives

15) With regards to minerals and osteoporosis, cite specific textural evidence research, medical literature, and new articles in order to:
    a. Describe the disease/condition, including symptoms and organ(s) affected.
    b. Justify the role of nutrition as a contributor to the disease/condition and highlight specific dietary recommendations for minimizing those contributions.
    c. Justify the role of nutrition as a in the treatment of the disease/condition, outlining a healthy eating plan and providing lists of specific foods/nutrients to reduce or exclude from the diet and those that should be included in the diet.
    d. Make recommendations for other lifestyle changes that will reduce the risks or aid the therapy for the disease/condition.
    e. Prepare a menu item that meets the nutritional recommendations for maintaining good bone health.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 4, 6, 7, 8; TN A&P 1, 3; FACS 9)

Vitamins

16) Use nutritional journals or articles to investigate the chemical properties of water-soluble and fat-soluble vitamins. Create a graph that classifies each vitamin, the chemical properties, and deficiency signs in the human body. (TN CCSS Reading 2, 4, 6; TN CCSS Writing 2; TN Chemistry I 1; FACS 9, 14)
Suggested Labs: Vitamin C Titration (using pipettes); Fat Soluble Vitamins.

17) Write a research paper or conduct a project on one of the following diseases linked to vitamin consumption issues, using appropriate digital search resources and academic writing. Summarize symptoms, common causes, prevention strategies, and treatments. Topics might include but are not limited to:
    a. Beriberi
    b. Pellagra
    c. Scurvy
    d. Rickets

    (TN CCSS Reading 1; TN CCSS Writing 2, 8, 9; FACS 9, 14)

Clinical Nutritional Assessments

18) Compare and contrast the types of data collected, the insights they give into the nutritional status of a client, and the limitations of the data for the following four types of nutritional assessments used by a registered dietitian or other trained health care professional.
    a. Historical information
    b. Anthropometric data
    c. Physical examination
    d. Laboratory tests

    (TN CCSS Reading 1, 2; TN CCSS Writing 7, 8, 9; TN A&P Embedded Inquiry; FACS 9)

Nutrition Diagnosis and Intervention

19) Prepare a presentation or informative essay that explains the Nutrition Care Process to clients and/or their families and the role it plays in the total health care of a client. Outline what occurs in each of the four phases of the process: nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation. Include a list of frequently asked questions and their answers. (TN CCSS Reading 1, 2; TN CCSS Writing 6; TN A&P 1, 5; FACS 9)

Diet Analysis

20) Quantify the nutrient intake of individuals based on food journals, observations, or other reports. Using appropriate databases, determine the intake of macro- and micro- nutrients. Graph the results compared to the recommended intake of each nutrient. Write an explanation on why the data collected and analyzed would or would not be sufficient to make dietary changes. (TN CCSS Reading 2; TN CCSS Writing 6; FACS 9)

Behavioral-Environmental Assessments: The Individual Community

21) Review the tools for assessing community nutritional environment. Select one tool that identifies existing problems in the local community. Prepare a public serve announcement in the form of an editorial, a brochure, an online advertisement, or other artifact with the purpose of informing community members about the problem(s). (TN CCSS Reading 1, 3, 7, 9; TN CCSS Writing 2, 4, 7; FACS 9)

22) Compare issues related to hunger and malnutrition, food insecurity, and food insufficiency locally, nationally, and globally. Describe short-term and sustainable development relief efforts used to combat these problems. (TN CCSS Reading 1, 2, 8; TN CCSS Writing 4, 7, 8; TN World Geography; FACS 9, 14)

The Relationship of Nutrition to Specific Diseases

Obesity

23) Investigate obesity using academic research and news articles. Cite specific textual evidence in order to
    a. Describe the need for prevention of obesity to begin at an early age.
    b. Analyze the relationship between fat cell development and metabolism and the role of set-point theory in maintaining weight losses or gain.
    c. Differentiate between causes of obesity including genetics and environmental factors.
    d. List health problems associated with obesity. Include the dangers of fad diets, weight loss products and other gimmicks.
    e. Justify the use of a research-based weight-loss strategy that ensures adequate nutrition.
    f. Make a claim about the need for extreme measures (such as surgery) for extreme cases, supporting claim(s) with reasoning and evidence from research.
    g. Compare and contrast the impacts of lifestyle changes to increase physical activity, address stress and change environmental factors on an individual's weight.
    h. Make recommendations on activities necessary for the maintenance of weight loss.

    (TN CCSS Reading 1, 2, 3, 4, 7, 8, 9; TN CCSS Writing 2, 4, 6, 7, 8; TN CCSS Math N-Q, TN Biology Embedded Math, TN A&P 5; TN Scientific Research 4; FACS 9)
    Suggested Labs: Athropometry Lab; Nutritious Snack Lab

Eating Disorders

24) Differentiate between the major eating disorders (anorexia, bulimia, binge eating) and other forms of disordered eating to create a research project specifically addressing the following:
    a. Describe the disease/condition, including symptoms and specific ways the body is affected.
    b. Justify the role of nutrition as a contributor to the disease/condition and highlight specific dietary recommendations for minimizing those contributions.
    c. Justify the role of nutrition in the treatment of the disease/condition, outlining a healthy eating plan and providing lists of specific foods/nutrients to reduce or exclude from the diet and those that should be included in the diet.
    d. Make recommendations for other lifestyle changes that will reduce the risk or aid in the therapy for the disease/condition.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 1, 2, 4, 6, 7, 8; TN A&P 4, 5; FACS 9)
    Suggested labs: Demonstrate the effect of acid erosion on teeth

Acids & Bases their Relationship to Digestion

25) Using scientific articles and domain-specific vocabulary, define *acidic* and *basic* as they relate to nutrition. Create a pH scale including examples of common acidic and basic foods. In an accompanying narrative, summarize symptoms, common causes, and treatments for heartburn, acid indigestion, and ulcers.
    (TN CCSS Reading 1; TN CCSS Writing 2, 8, 9; TN Chemistry I 11)
    Suggested Labs: Acids & Bases Indicators in Food

26) For each of the following common digestive problems, summarize symptoms, common causes, prevention strategies, and treatments. Explain how they can impact the digestion and absorption of nutrients in the digestive system.
    a. Choking
    b. Vomiting
    c. Diarrhea, irritable bowel syndrome, colitis
    d. Constipation
    e. Belching and gas
    f. Heartburn and acid indigestion
    g. Ulcers

    (TN CCSS Reading 1, 2; TN CCSS Writing 2, 4, 7, 8, 9; TN A&P 5; FACS 9)

Food Intolerance and Allergies

27) Differentiate between food allergies and food intolerances, and describe the body's reaction to each. Research the eight most common food allergens. Describe treatment for an allergic reaction. Cite specific textual evidence in the application of knowledge, including:
    a. Describe how the immune system of a person with a food allergy responds when exposed to the food allergen. Contrast this to reactions originating from a food intolerance.
    b. Outline precautions to take when avoiding food allergens and/or foods to which they have an intolerance both at home and when eating out.
    c. Recommend food substitutes and recipe modifications to avoid problematic foods, citing specific reasoning and evidence to justify the recommendation.
    d.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 1, 2, 4, 6, 7, 8; TN A&P 4, 5; FACS 9)
    Suggested labs: Using indicators to identify which "student" (solution) is allergic (shows reaction to) to an allergen.

Nutrition and Cancer

28) Assess the impact of nutrition on cancer focusing on the body sites affected. Cite specific textual evidence from academic research, medical literature and news articles in order to:
    a. Describe the disease/condition, including symptoms and organ(s) affected.
    b. Justify the role of nutrition as a contributor to the disease/condition and highlight specific dietary recommendations for minimizing those contributions.
    c. Justify the role of nutrition in the treatment of the disease/condition, outlining a healthy eating plan for those undergoing treatments such as chemotherapy and radiation, and providing lists of specific foods/nutrients that act as antipromoters from the diet and those that should be included in the diet.
    d. Make recommendations for other lifestyle changes that will reduce the risk or aid in the therapy for the disease/condition.
    e. Prepare a menu item that meets the recommendations for reducing the nutritional risks for developing cancer.

    (TN CCSS Reading 1, 2, 4, 7, 8, 9; TN CCSS Writing 1, 2, 4, 6, 7, 8; TN A&P 1, 4, 5; TN Biology I 1; FACS 9)

29) From class research on the relationship between nutrition and specific diseases, select a topic where the need for further research has been identified. As a class or in small groups, outline the design for an experiment to continue the research. (TN Scientific Research 1, 2, 3; FACS 9)

The following artifacts will reside in the student's portfolio:

- Nutrition and Illness
- Metabolic Pathways graphic
- Nutrition Care Process Diagnosis
- Diet Analysis graph
- Food and Nutrient Delivery
- Public Service Announcement
- Artifacts on Disease, Intolerance, and Condition and their relationship to Nutrition

Standards Alignment Notes

*References to other standards include:

- TN CCSS Reading: Tennessee Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 5, 6, and 10 at the conclusion of the course.
- TN CCSS Writing: Tennessee Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3, 5, and 10 at the conclusion of the course.
- TN CCSS Math: Tennessee Common Core State Standards for Mathematics; Math Standards for High School: Number and Quantity, Algebra, Interpreting Functions and Statistics and Probability.
- TN Chemistry I: Tennessee Science: Chemistry I standards may provide additional insight and activities for educators.
- TN Biology: Tennessee Science: Biology I standards may provide additional insight and activities for educators.
- TN A&P: Tennessee Science: Human Anatomy & Physiology standards may provide additional insight and activities for educators.
- TN Scientific Research: Tennessee Science: Scientific Research standards may provide additional insight and activities for educators.
- FACS: National Standards for Family and Consumer Sciences Education, Second Edition: National Association of State Administrators of Family and Consumer Sciences, FACS.
- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.